Women's employment adjustments after an adverse health event

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Abstract

An adverse health event can affect women's work capacity as they need time to recover. The institutional framework in the Netherlands provides employment protection during the first two years after the diagnosis. In this study, we have assessed the extent to which women's employment is affected in the short and long term by an adverse health event. We have used administrative Dutch data which follows women aged 25 to 55 years for four years after a medical diagnosis. We found that diagnosed women start leaving employment during the protection period and four years later they were one percentage point less likely to be employed. Women in permanent employment did not reduce their employment during the protection period and only later reduced their employment marginally (less than 0.5 percentage points). Furthermore, we found that during the employment protection period women adjusted their labor market participation both through changes in their employment status and working hours. After the protection period, however, the adjustments were predominantly through the employment status. Lastly, we found that women who were diagnosed with chronic and incapacitating conditions experienced a long term wage decrease of about 0.5 percent; while women diagnosed with chronic and non-incapacitating conditions experienced no wage changes in the short or long term; and women diagnosed with temporary health conditions experienced only a short term decrease in their wage of about 0.5 to 1.5 percent.

Keywords: Adverse health event, employment, wage, working hours, institutional setting, compositional structure, the Netherlands.

JEL classifications: I12, I18, J21, J22, J31.

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1. Introduction

Adverse health events may cause individuals to stop working, reduce their hours of work or decrease their wages. Previous studies such as Halla and Zweimuller (2013) and Garcia-Gomez, Van Kippersluis, O'Donnell and Van Doorslaer (2013) show that unhealthy women are less likely to be employed than healthy women and the difference in employment increases during the three years after an adverse health event. These empirical findings, however, are not in line with the Grossman model (1972), according to which the largest reduction in employment should be when the adverse health event occurs. At that point the individuals lose part of their health capital and therefore they need to spend more time on recovering it. As a result, they have less time available for work and leisure, and ultimately work less. This discrepancy between the empirical evidence and the economic theory is likely to arise from the institutionalized employment protection system which is in place in most of the developed countries, and which is likely to mitigate the negative employment consequences of an adverse health event. In the Netherlands, the country investigated in this study, employees could take up to two years of sickness leave after an adverse health event (WVBLZ; Wet verlenging loondoorbetalingsplicht bij ziekte, 2004). During this time the employee is entitled to her salary[1] and she could accommodate the (possible) reduction in her employment capacity by changes in her working hours and/or job tasks. Furthermore, during this time she could not be laid off; however, if she is on a temporary contract, the employer is not obliged to extend her contract until the end of the second year[2]. As such, the system is designed to mitigate the short-term (financial and employment) impact of a health condition and enable the employee to recover in the meantime. Nevertheless, not all employees recover – some health conditions have a more permanent nature and lead to permanent reduction of employment capacity. Employees with such health conditions can enter disability insurance after the two year period[3]. Indeed, Pelkowski and Berger (2004) show that the long term impact of health conditions on employment is related to the permanent nature of the health problem. On the other hand, Garcia-Gomez (2011) argues that besides the severity of the health problem, the generosity of the social security system could explain partially the employment outcome.

[1] A minimum of 170% of her last salary, which is spread over the two-year period.

[2] In case the contract finishes before that, the employee receives their salary from a government fund (Ziektewetuitkering) and there is a re-integration coach to help her find a new job.

[3] The minimum required reduction of employment capacity to enter DI is 35%.

The aim of this paper is to investigate whether women in the Netherlands change their employment after an adverse health event and whether the magnitude of this reduction could be explained by the institutional job protection and/or the type of health condition. We analyze Dutch administrative data from 2008 to 2012, which follow women for four years after an adverse health event and report on their employment, working hours and wage developments.

Our contributions are four fold. First, we contribute to the literature on how labor market institutions affect the behavior of employees after an adverse health event by comparing the employment changes of women during the period of institutionalized job protection and the years after that. A study most close to ours is Garcia-Gomes et. al. (2013), who consider the labor market adjustments after an acute hospitalization during a different institutional setting in the Netherlands. In the time period they study, 1998 to 2005, the institutionalized job protection period is one year and the disability level required for entry in disability insurance is 15%; our study considers the years after, when the protection is two years and the required disability 35%. Such a difference in the institutional setting is likely to result in stronger financial incentives for returning back to work. Our results show that even though there is institutional protection, women leave employment in the short term and this continues even four years later. Furthermore, we observe that during the period of employment protection women adjust their working hours and leave employment, while after the period of protection they predominantly leave employment.

Our second contribution is with respect to the degree of institutional job protection. Markussen, Mykletun and Roed (2012) outline the benefits of working part-time before the full recovery from the health condition. They find that employees who are required to work up to their available working capacity in order to receive their sickness benefits have better subsequent employment probability in comparison to employees who are not required to work until they fully recover. Similar to them, we find that the group of permanently employed women, or the women who can return to their job, have a lower reduction in employment throughout the four years after the diagnosis. Furthermore, we found that they did not leave employment in the short term and the minor reduction in employment is observed only in the long term, which suggests that longer job protection, or the possibility to return to work rather than look for a job, could be beneficial for the re-integration in the work environment.

Third, we contribute to the literature related to impact of health conditions on employment based on their severity by distinguishing among different types of adverse health events and comparing the labor market adjustments after each of them. The first study which considers the impact of severity on labor supply is Pelkowski and Berger (2004) and it shows that while temporary health conditions do not have an impact on working hours and the hourly wage, this is not the case for permanent health conditions. The study of Lundeborg et. al. (2015) goes further in the comparison between health conditions and considers the ten most common medical diagnoses in Sweden. The study assesses whether there are differential income adjustments between employees who suffer from the same disease but have different levels of education. The authors find similar magnitudes across diseases. However, they do not compare the income differential between employees who suffered from a health condition and those who did not.[4] We find that especially the wage developments are related to the type of health condition: while non-chronic conditions lead to temporary reduction in the wage, chronic and incapacitating health conditions lead to permanent reduction, and chronic and not-incapacitating conditions are not related to wage reductions. Our results are similar for women in permanent employment.

Last, by considering simultaneously the severity of the health condition and the degree of institutional protection we contribute to the literature that disentangles the two effects. To the best of our knowledge, there is no other study that attempts to do that. We find that while the employment adjustments differ between women in temporary and permanent employment, this is not the case for the wage adjustments. The latter, however, could be related to the severity of the health condition, while this is not the case for the former.

The remainder of the paper is organized as follows: Section 2 outlines the theoretical framework and the institutional setting in the Netherlands. Section 3 describes the data and Section 4 the empirical methodology. Section 5 outlines the results, and Section 6 gives the discussion and conclusion.

[4] They find an educational gradient: individuals having a lower education (or low skills) suffer from a stronger negative impact on their earnings. They do not find any significant differences in the income differential across the disease groups.

2. Theoretical framework and Institutional setting

Grossman (1972) argues that health shocks negatively impact the distribution of the individual's time between work and leisure, as they demand time for health recovery. Poor health also negatively affects productivity and taste for work, and as a result increases the marginal value of leisure (Bradley, Bednarek & Neumark, 2002). This change in preferences moves the utility maximizing choice towards less time spend on work. Therefore, an individual suffering from a health condition would reduce her labor supply immediately after the health shock, but upon recovery the impact should be smaller or may even disappear.

Upon return to work the employee may not poses the same skill set. First, this could be a direct outcome of the health condition, for example partial disability. Second, there could be depreciation or atrophy of skills due to not actively using the human capital (Mincer and Ofek, 1982). Such a setback may lead to lower productivity upon return to work, which ultimately would result in a lower wage. However, some of the 'lost' knowledge could be restored in the short term. Re-learning old skills is faster than acquiring new knowledge (Mincer and Ofek, 1982) and as a result the productivity increase will be steeper during the former and the employee would return to her productivity level from before the work disruption.

Based on these theoretical insights we expect that after an adverse health event, employees will reduce their labor supply and when they return to work, upon recovery, they will have a lower productivity.

Previous studies have found that the labor supply immediately decreases after a health condition. For instance, Halla and Zweimuller (2013) consider how accidents to and from work impact the consequent employment of the individual. They find an immediate negative impact on work in the form of absenteeism (on average 46 days), which is followed by increased probability of leaving work through unemployment, and later on entry in disability retirement. The negative employment effects are present even five years after the accident and the individuals who stay in employment suffer from a continuous decrease in earnings.

Garcia-Gomez et al. (2013) also finds that the negative effect on employment after a health condition (acute hospitalization) increases over time: in the beginning it is relatively small, it reaches seven percentage points decrease in the second year, and there is no recovery six years later. The authors explain the small initial effect by the (possible) sickness leave, which delays leaving employment. Furthermore, they find that the employees who leave employment are likely to enter disability insurance and the one who stay employed experience long term reduction in annual income from the onset of the disease.

Overall, studies have shown that adverse health events reduce the employment probability (e.g., Jones et al., 2016; Halla and Zweimuller, 2013; Garcia-Gomez et al., 2013; Moran, Short and Hollenbeak, 2011; Heinesen and Kolodziejczyk, 2013). However, this reduction increases over time which is the opposite of what the Grossman model (1972) predicts. The delayed impact on employment could be explained by the institutionalized job protection period in the developed countries, during which the employee can take sickness leave without losing her job while she recuperates. Furthermore, some countries also have integration policies, which encourage the employee to come back to work and, if needed, provide her with extra training. As such the institutional setting plays an important role in augmenting the relationship between adverse health events and employment. The institutional setting, according to Garcia-Gomez (2011), could partially explain why employees in nine European countries reduced differently their employment after a health shock. The author argues that more generous institutions are related to less work participation after an adverse health event, and vice versa. Bradley et al. (2013) also find that the institutional setting is important for the employment decision of women after a severe health condition. After surviving breast cancer the women who were not eligible for a health insurance through their spouses were less likely to leave their job in order to keep their eligibility for health insurance.

In the Netherlands, since 2004, the institutional setting grants employees the opportunity of two years sickness leave after an adverse health event[5,6]. During this time, the employee cannot be dismissed and is entitled to a total of 170% of their last yearly salary over a two-year period.[7] In the occasion that the employee has a temporary contract which expires during this two-year period, the employer has a responsibility for payments until the end of the contractual time, after that the individual is entitled to sickness benefits from the government for the remainder of the time period (Sickness Benefit Act, Ziekte Wet). Furthermore, if the contract expires during the protection period, the law does not oblige the employer to extend the temporary contract until the end of the protection period. On the other hand, for the employee to

[5] See Van den Bemd and Hassink (2012) for a more detailed description of absenteeism regulations in the Netherlands.

[6] See De Vos, Kapteyn and Kalwij (2012) for a more detailed description of the Dutch disability insurance, pension and unemployment schemes.

[7] With a yearly minimum of 70% of gross salary. Usually 100% is paid in the first year and 70% in the second.

be entitled to this protection period and benefits, she has to exert effort corresponding to her available work capacity, according to the Gatekeeper Improvement Act (Wet Verbetering Poortwachter, 2002). The Gatekeeper Act aims at improving the re-integration of the employee in the company and requires the employer to provide the employee with a participation plan for the sickness period. The plan may involve reducing the amount of working hours, finding suitable tasks to the new physical situation of the employee, and/or re-adjusting the workplace in order to accommodate better the employee's needs. The law also specifies sanctions in case of non-compliance, such as: extension of the sickness leave period during which the employee is entitled of salary (a maximum of one year); or no salary during the sickness leave period. If the employee's health has not recovered after the two year period, she could apply for disability benefits. The decision, whether they are granted and for how long, is based on the level of disability, the expected recovery, and the integration efforts during the period of sickness absence.

In conclusion, the current institutional framework in the Netherlands provides the employees with job security in the event of a health condition. It enables them to continue working during the first two years of the illness as it requires from the employer to find suitable tasks to accommodate their physical limitations. The income effects of the health condition are also limited in the short term due to the continuation of the salary payment. Therefore, we expect that the employment would change mostly after the institutional protection is over, namely two years after the adverse health event.

3. Data

We use individual level administrative data for the years 2008 to 2012 that contain information on employment, demographics and health and have been retrieved from five different sources and provided by Statistics Netherlands. First, the employment spells data were obtained from the Social Statistical Dataset on Jobs (Sociaal Statistisch Bestand, SSB-banen, 2008-2012). Second, personal income and the socio-economic status of the women were obtained from the Integrated Personal Income data set (Integraal Persoonlijk Inkomen, 2008-2012), which has been collected by the tax authorities. Third, information about the age, gender and family situation, were retrieved from the Municipality Registry (Gemeentelijke Basisadministratie, GBA, 2008-2012). Fourth, the medical information, in the form of hospital entries, was obtained from the National

Medical Registration (Landelijke Medische Registratie, LMR, 2000-2012), which was provided to Statistics Netherlands by the foundation for Dutch Hospital Data. Because of LMR's limited coverage in some of the years, we used the final data set – the Housing Registry (Woomruimteregister, WRG, 2000-2012), to correct for the coverage (see Appendix 1). The combined data follows about 9.35 million women who were registered in a Dutch municipality between 2008 and 2012. Women enter our dataset in 2008 or in a later year when they reach the age of 25 or emigrated to the Netherlands and we cease observing women after 2012 or after an earlier year when they have deceased, reached the age 56 or have immigrated from the Netherlands.

3.1.Sample selection

For the time period 2008 to 2012, we select women who are between 25 and 55 years for all years of observation. We removed women under age 25 as they can still be in education and above age 55 to avoid issues related to early retirement. This reduced our sample with about 56 percent. Furthermore, we excluded the women who were classified according to their socio-economic status as self-employed (5.91%) and students (0.4%), because their main occupation is not contractual employment, which is what we can observe in the data.

Individuals living in certain areas of the country have been excluded because these areas are not covered by the Hospital registry (the LMR dataset). Based on information from the Housing registry we were able to determine which of the 415 municipalities were fully covered by the LMR. As it turned out, a minimum of 7 municipalities in 2005 and a maximum of 44 in 2008 were not fully covered and women residing in these municipalities, and in those years, have been excluded from our sample (see Appendix 1 for more details). On an individual level, this caused a reduction in sample size of minimum of 1.44% in 2005 and maximum of 8.29% in 2008.

Lastly, missing values on key variables caused a further reduction in the sample size. As a result, our final sample consists of 3,096,239 women and on average they are observed for 2.79 years from 2008 to 2012.

3.2. Adverse health event

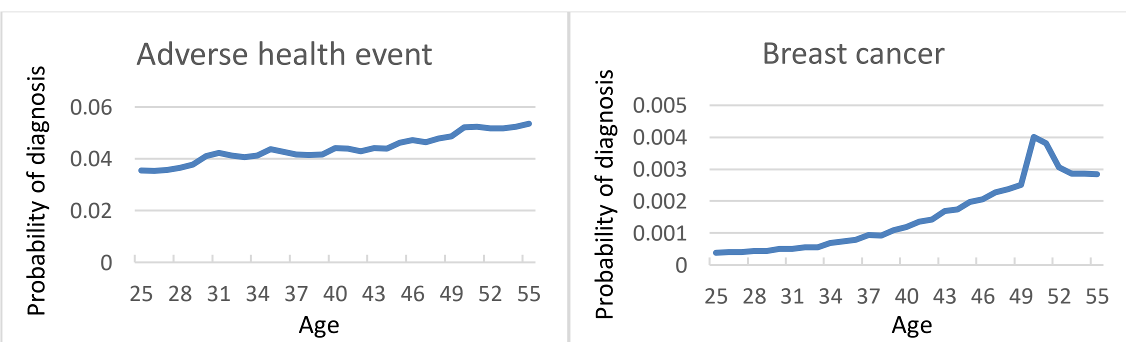
The medical history of a woman consists of diagnoses received during hospital admissions. If in a given year she receives a medical diagnosis, but she did not receive one in the four years prior to that year, this diagnosis is defined as a new diagnosis and is referred to as an adverse health event. Since we use the Hospital registry from 2000 onwards to retrieve the medical history, the first adverse health event could be observed in 2004.

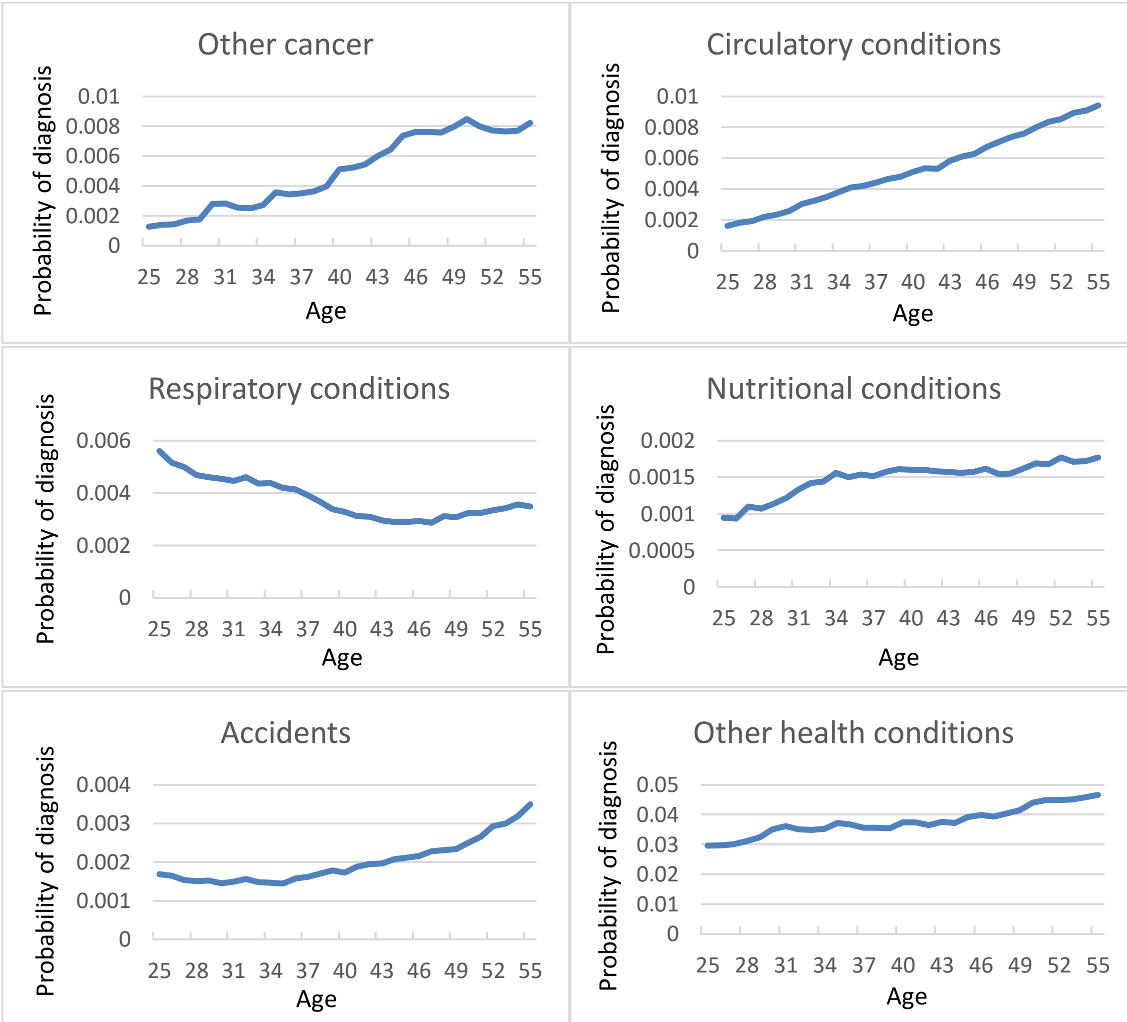
In the analysis we first consider any diagnosis when defining a new adverse health event and next we distinguish seven diagnoses during a hospital visit, namely breast cancer, other cancers, circulatory conditions, respiratory conditions, nutritional conditions, accidents, and other health conditions. In the latter case, a diagnosis is considered new if the patient did not receive the same type of diagnosis during the previous four years.

We consider different groups of health conditions because if they are chronic and/or incapacitating, they may lead to different work adjustments in the short and long term. We expect that conditions that women can recover from, such as cancer, would lead to temporary work adjustments. Furthermore, chronic and incapacitating conditions, such as circulatory conditions, could lead to long-term adjustments in the work participation, in order to accommodate the change in work capabilities. Lastly, we expect that chronic but not-incapacitating conditions, such as respiratory and nutritional conditions, would not impact the work adjustments, since they do not impose long-term restrictions on the work capacity.

The incidence of a new adverse health event increases with age (Figure 1; top left graph). The incidences of new adverse health events differ across disease types and all increase with increasing age except for respiratory health conditions (Figure 1). The latter health conditions are often chronic and are often diagnosed already early in life.

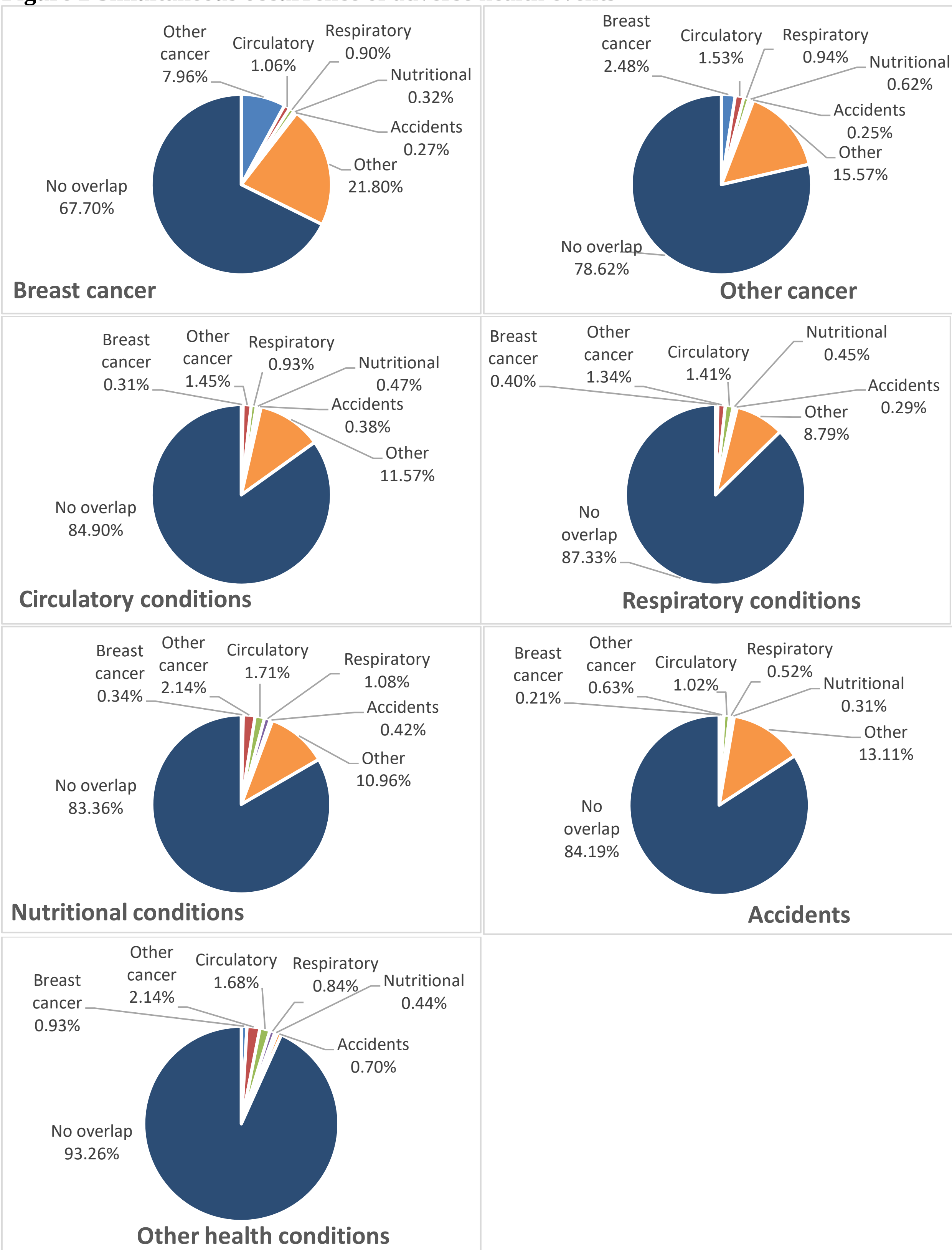
Figure 1 Adverse health events by age and type of diagnosis





Some women may receive more than one new diagnosis during the calendar year (Figure 2). For example, 32.3% of the patients with breast cancer have received another diagnosis in the same year (maximum overlap), while this is the case for only 12.7% of the patients with respiratory conditions (minimum overlap). Across all health conditions, however, there is a common trend of another diagnosis: women are relatively likely to be diagnosed with another health conditions; and relatively unlikely to have an accident (except for the group with other health conditions).

Figure 2 Simultaneous occurrence of adverse health events



3.3.Labor market participation

Labor market participation is described in this paper by the employment status, the number of hours of work and the hourly gross wage rate. Younger women, on average, are more likely to be employed (90% at age 25 vs 64% at age 55; Figure 3, top left graph), to work longer hours (1670 hours per year at age 25 vs 1392 hours at age 55; top right graph), and to earn less (€13 at age 25 vs €17 per hour at age 55; bottom graph).

Figure 3 Employment status, annual hours of work, and hourly wage rates by age

Since job protection differs between employees on temporary and permanent contracts, it is important to take this into account. According to the law in the Netherlands, employees cannot stay on a temporary contract in the company for more than three years. After the third year of employment, the contract has to become permanent or the employee is laid off. Therefore, we define that a woman has a permanent contract if she has been with the company for more than three years. Following this definition, we observe 36.73% women (44.48% of the employed sample) in permanent employment.

3.4. Mortality

We observe the employment patterns only for the women who survive. As such it is important also to consider the differences in the mortality rates between the women diagnosed with different health conditions. We distinguish between women who are: healthy (they have not had a health condition during the last four years), unhealthy (they have visited a hospital during the last four years), and diagnosed for a first time with: any health condition, breast cancer, other cancer, circulatory condition, respiratory condition, nutritional condition, other health condition or had an accident. Table 1 shows the four-year mortality rate from the time of diagnosis. We consider separately employed women (Panel A) and not-employed women at the time of diagnosis (Panel B), because they could have different mortality rates (Martikainen & Valkonen, 1996). [8]

First, we observe that initially employed women have consistently lower mortality than initially not-employed women, which is in line with the findings of Martikainen and Valkonen (1996). Second, we observe that unhealthy women have a higher mortality rate than the healthy one. Third, women diagnosed with cancer have the highest mortality rate. However, while the mortality of women diagnosed with cancer decreases over time for the employed women, the one of the initially unemployed does not seem to have a trend. Last, the lowest mortality is observed in the group of women who suffer from other health conditions (for the initially unemployed) and who have had an accident (for the initially employed).

Table 1: Four-year mortality statistics by employment status and type of diagnosis

Panel A: Employed women at the time of diagnosis

Year	Not diagnosed		First diagnosed	Breast cancer	Other cancer	Circulatory conditions	Respiratory conditions	Nutritional conditions	Other health conditions	Accidents
	Healthy	Not Healthy								
2004	0.29%	0.66%	1.08%	7.58%	7.03%	1.26%	1.16%	1.64%	0.98%	0.77%
2005	0.28%	0.66%	1.08%	6.72%	6.64%	1.20%	1.11%	1.31%	1.02%	0.94%
2006	0.27%	0.66%	1.02%	6.52%	6.87%	1.09%	1.14%	1.13%	0.98%	0.83%
2007	0.28%	0.67%	0.97%	6.03%	6.87%	1.13%	1.32%	1.60%	0.92%	0.70%
2008	0.28%	0.65%	1.03%	6.02%	6.61%	1.15%	1.22%	1.68%	0.99%	0.93%

[8] Table 1 does not include the women who are diagnosed and die in the same calendar year, since they are not considered in the empirical analysis, because we always observe employment on December 31st of the calendar year. For these mortality statistics, please see Appendix 3.

Panel B: Not-employed women at the time of diagnosis

Year	Not diagnosed: Healthy	Not diagnosed: Not Healthy	First diagnosed	Breast cancer	Other cancer	Circulatory conditions	Respiratory conditions	Nutritional conditions	Other health conditions	Accidents
2004	0.68%	1.98%	2.22%	11.52%	11.63%	3.39%	4.72%	5.46%	2.27%	3.99%
2005	0.68%	1.91%	2.24%	10.37%	11.36%	3.32%	4.92%	4.95%	2.25%	4.39%
2006	0.69%	1.94%	2.21%	9.67%	11.09%	3.19%	5.17%	5.08%	2.23%	3.36%
2007	0.71%	1.97%	2.21%	10.80%	11.82%	3.38%	5.10%	5.79%	2.25%	3.09%
2008	0.72%	2.02%	2.24%	9.38%	12.10%	3.62%	5.60%	4.68%	2.27%	3.81%

4. Empirical Framework

To estimate the effect of an adverse health event on employment, we first need to define an adverse health event. Since we observe hospital visits, we cannot distinguish between visiting the hospital for a first and a second time. Therefore, we will use the history of hospital visits over a four year period to identify a new adverse health event: let *H* be equal to 1 if a woman visited a hospital during the calendar year and did not visit a hospital during the last four years; and 0 otherwise. Using this definition, however, *H* is equal to 0 for two groups of women: first, those that have not visited a hospital during the last four years and the current year, which we consider as healthy; and second, those that have visited a hospital during the last four years and the visit in the current year is a second time visit. To be able to distinguish between these two groups, we will include in our empirical specification controls for previous hospital visits. As a result the parameter estimate in front of *H* would give the difference between healthy women and women suffering from an adverse health event.

First, we estimate the effect of an adverse health event on employment:

$$Y_{i,t} = \beta_0 + \sum_{k=1}^{5} \beta_k H_{i,t-k+1} + \mathbf{X}_{i,t}\boldsymbol{\eta}' + \delta_t + \alpha_i + \epsilon_{i,t} \qquad (1)$$

$$t = 2008, \ldots, 2012$$

where $Y_{i,t}$ represents the employment status (employed or non-employed) of individual *i* and time *t*. The variable $H_{i,t}$ is equal to one if a woman experiences a new adverse health event at time *t* and zero otherwise. We include the incidences of adverse health events, *H*, from the four previous years to distinguish short from long term effects. Then, the vector $X_{i,t}$ includes controls for 1) previous health, captured by dummies denoting previous hospital visits; 2) household characteristics in year *t*, namely: having a partner and the log of his income; log of the number of adults living in the household; number and age of the kids, where both variables are represented by dummies distinguishing between four categories; 3) age dummies. Then, δ_t is a time fixed effect, α_i is an individual specific random effect and $\epsilon_{i,t}$ is an idiosyncratic error term.

We estimate equation (1) using a Linear Probability model - we use a pooled OLS method and cluster the standard errors at the individual level to account for the panel structure of the data[9]. However, it is likely that there is time-invariant individual heterogeneity, such as preferences for working or initial health status, for example, which is correlated to the explanatory variables and therefore we use a fixed effect transformation of the Linear Probability Model to account for it. We compare the results of the different methods.

Next, we consider the adjustments in the working hours of women after an adverse health event:

$$T_{i,t} = \gamma + \sum_{k=1}^{5} \gamma H_{i,t-k+1} + \boldsymbol{X}_{i,t}\boldsymbol{\pi}' + \omega_t + \iota_i + \nu_{i,t} \qquad (2)$$

$$t = 2008, \dots, 2012$$

where $T_{i,t}$ denotes the working hours of individual *i* in year *t*, measured on an yearly basis; ω_t is a time fixed effect; ι_i is an individual specific random effect and $\nu_{i,t}$ is an idiosyncratic error term. The rest of the notation is identical to the one in equation (1).

First, we estimate equation (2) using two different models: a linear model and a Tobit model. For the linear model we use pooled OLS method. The Tobit model is a non-linear model which takes into account the censoring of the data, namely the fact that individuals cannot work less than 0 hours and more than full time during the whole year resulting in 2080 hours. As a result the predicted values of the dependent variable are positive. Second, we consider the sample of employed women in order to see only the changes in the working hours, without taking into account the women who completely stop working (which would mean moving to 0 hours). We estimate a Linear Model using pooled OLS method and we cluster the standard errors on the individual level to account for the panel structure of the data. However, as in the employment equation, it is likely that there is time-invariant individual heterogeneity that is not observed. It is

[9] We assume that there is no unobserved individual heterogeneity and therefore we have composite error term $\alpha_i + \epsilon_{i,t}$.

likely to be correlated to the other explanatory variables and therefore we estimate the linear model using a fixed effects method. We compare the results of the different methods.

Lastly, we observe a wage rate only for employed individuals. To estimate how an adverse health event affects the earning capability of an individual, we will use Heckman's two step procedure (Heckman, 1979), which corrects for the initial selection into employment, or the notion that women with better career possibilities and earning potential are more likely to stay in employment. First, we estimate a participation equation, equation (1), using a Probit model and calculate based on it the inverse Mills ratio. Second, we estimate an outcome equation for the sample of employed women using pooled OLS estimator:

$$W_{i,t} = \tau_0 + \sum_{k=1}^{5} \tau_k H_{i,t-k+1} + \boldsymbol{F}_{i,t}\boldsymbol{\kappa}' + \lambda_{i,t} + \rho_t + \varphi_i + \upsilon_{i,t} \qquad (3.1)$$
$$t = 2008, \ldots, 2012$$

where $W_{i,t}$ denotes the log of the wage rate of individual *i* in year *t*; $\boldsymbol{F}_{i,t}$ includes controls for previous health and age dummies; ρ_t is a time fixed effect; φ_i is an individual specific random effect and $\upsilon_{i,t}$ is an idiosyncratic error term. $\lambda_{i,t}$ denotes the Mills ratio for individual *i* in year *t*, which is calculated from equation (1). Selection into employment is assumed to be dependent on the household characteristics in time *t* namely: having a partner, log of his income, log of the number of adults living in the household, number and age of the kids. Those variables are assumed not to impact the wage rate directly and therefore are excluded from the wage equation.

We compare the results from the Heckman-selection model to the Pooled OLS estimates of the following equation for employed women:

$$W_{i,t} = \theta_0 + \sum_{k=1}^{5} \theta_k H_{i,t-k+1} + \boldsymbol{F}_{i,t}\boldsymbol{\mu}' + \varsigma_t + \ddot{\imath}_i + u_{i,t} \qquad (3.2)$$
$$t = 2008, \ldots, 2012$$

where ς_t is a time fixed effect; $\ddot{\imath}_i$ is an individual specific random effect and $u_{i,t}$ is an idiosyncratic error term. The difference between equation (3.1) and (3.2) is that the latter does not take into account the selection into employment. A comparison between the results from the two equations will indicate if there is endogenous selection into employment. If so and we do not account for it, then the wage estimates will be inconsistent.

Lastly, we estimate equation (3.2) as a linear model using fixed effects transformation in order to account for the possible unobserved time-invariant individual heterogeneity, which could be correlated to the other independent variables. We compare the results of the different methods.

As a starting point, we estimate equations (1), (2), (3.1) and (3.2) without distinguishing between the types of adverse health events. Subsequently we consider the different types of adverse health events separately, namely: breast cancer, other cancers, circulatory conditions, respiratory conditions, nutritional conditions, accidents, and other health conditions. The inclusion of the different adverse health events simultaneously limits the misallocation of (estimated) effects across illnesses. The later problem arises from the possibility that an individual suffers from more than one type of an adverse health event at a time.

Finally, we perform the whole analysis on a subsample of permanently employed women to see if the difference in the legal protection related to the type of contract – temporary or permanent, could be related to our results.

5. Results

5.1. Employment adjustments

First, we consider the employment adjustments of women after an adverse health event, without distinguishing between the different types of health conditions. All estimation results are presented in Appendix 5 and below we graphically present our main findings. Figure 4 (top left graph) shows the employment adjustments of women who have experienced an adverse health event at time zero (i.e. the time of diagnosis). The adjustments are measured relatively to the ones of women with the same characteristics at that time and who did not experience an adverse health event. First we estimate a Pooled OLS model. The estimates show that an employment gap of about one percentage point is already present at the time of diagnosis which suggests that, on average, women prone to health conditions have a worse position on the labor market. This gap increases in the years thereafter and reaches four percentage points four years later. However, it is likely that there is unobserved time-invariant individual heterogeneity and therefore we estimate a fixed effects linear probability model. The estimates show that there is no employment gap at the time of diagnosis and that it reaches 0.90 percentage points in the following three years followed by a slight recovery to 0.80 percentage points after four years. The differences between the Pooled OLS and FE-LPM results most likely stem from the fact that non-employed women are more likely to experience an adverse health event, as has been found as well in the literature on socioeconomic status differences in health (Cutler, Lleras-Muney & Vogl, 2011), and not taking into account this unobserved individual heterogeneity is likely to increase the magnitude of our results.

Our findings are in line with Garcia-Gomez et al. (2013), who found a small initial decrease in employment during the first year after acute hospitalization, which reaches seven percentage points in the second year, with no recovery six years later. Since they look only at acute hospitalization, this can explain the stronger effect that they find. Other studies, such as Halla and Zweimuller (2013), also find this long term negative effect of adverse health on employment.

Though we expected to observe an institutional protection period of two years during which the employment of women who have experienced an adverse health event does not decrease, we did not. However, when we consider women with a permanent contract separately, we do observe different employment adjustments (see Figure 4, top right graph). As above, we first estimate a Pooled OLS model. The estimates show an employment gap between the healthy and unhealthy women, which exists since the time of diagnosis (approximately one percentage point) and expands after the first year to 4.6 percentage points four years after the diagnosis. This result suggests that there is institutionalized job protection in the beginning, however the reduction in employment four years after the diagnosis is comparable to the one of the full sample. It is likely though that there is time-invariant individual heterogeneity which is not observed. Therefore, we estimate a fixed-effect LPM. The estimates show that after an adverse health event women are more likely to be employed in comparison to their peers at the time of diagnosis (0.2 percentage point), year one after the diagnosis (0.2 percentage points), and year two (0.07 percentage point), but they are less likely to be employed in year three (0.37 percentage points) and four (0.41 percentage points). Such a pattern of employment adjustment suggests that there is institutionalized job protection for the women on permanent contracts during the first two years after the adverse health event—even though comparable women leave their jobs, which can be related to the business cycle, the women who have experienced an adverse health event do not do so and therefore are more likely to be employed. However, once the protection period of two years is over, the latter are likely to leave employment and as a result are less likely to be employed than their peers. This is quite different in comparison to our initial results, where we did not observe any signs of the institutionalized job protection. Furthermore, the reduction in employment for women on permanent contracts four years after the adverse health event (0.41 percentage points) is half of the reduction of the full sample (0.80 percentage points).

Overall our employment results suggest that there is unobserved time-invariant individual heterogeneity and therefore out preferred estimates are the ones from the Fixed effects model.

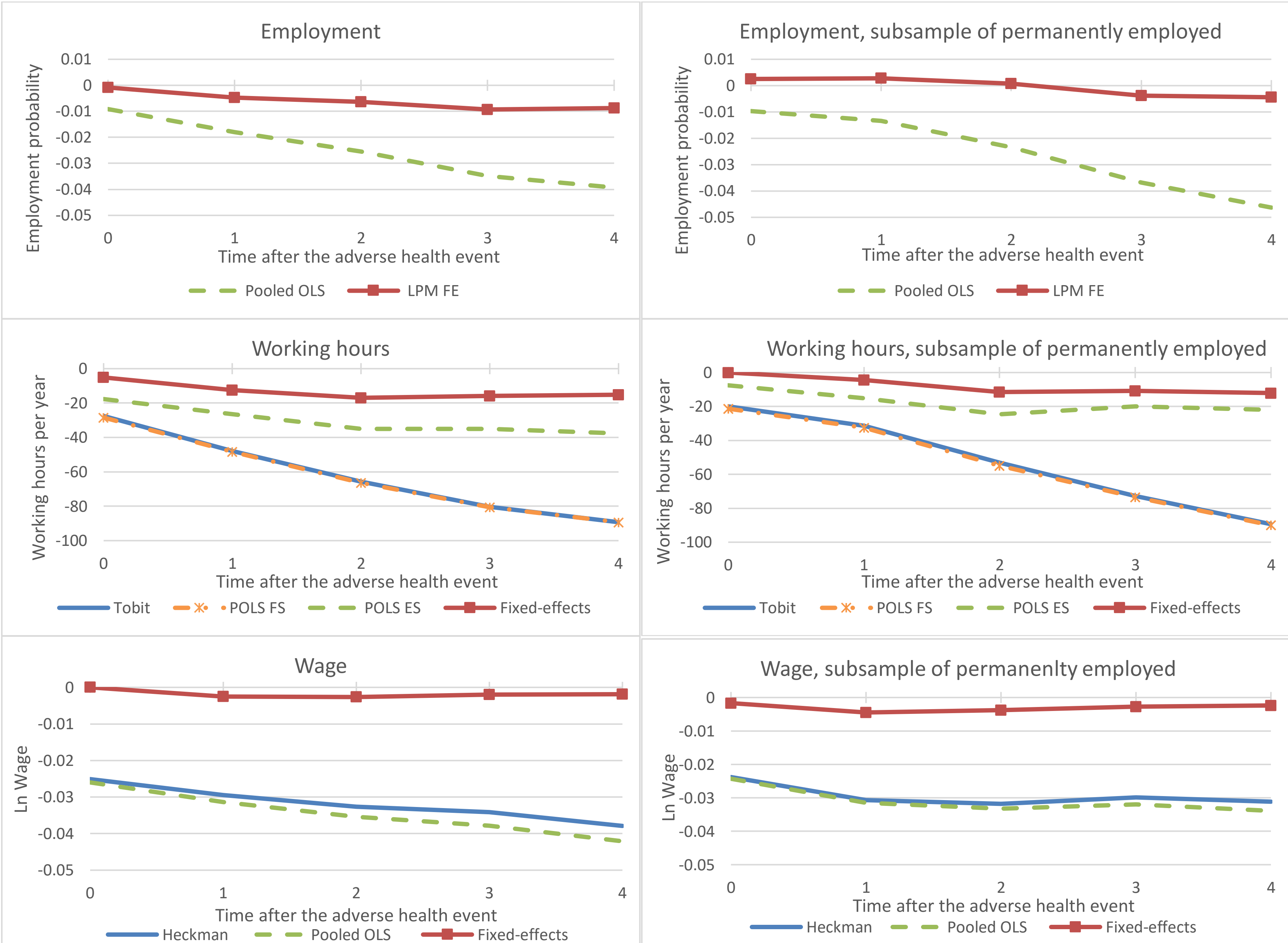
5.2. Working hours adjustments

Next, we consider the working hours' adjustments after an adverse health event. Figure 4, middle left graph, shows the estimates for the four models outlined in section 4. Again, the gap in hours of work presented is the difference between hours of work of women who have and those who have not experienced a new adverse health event and have otherwise the same observed characteristics. All estimators show that there is a gap and that it increases over time. The results of the Tobit model and Pooled OLS (full sample) are very similar, which suggests that correction for the data censoring is not important. Furthermore, they estimate a larger gap than the other two models: 27,5 hours per year at time of diagnosis, which expands four years later to 89 hours per year. This difference could be explained by the underlying samples: since the Tobit and the Pooled OLS (full sample) consider all individuals, they compare not only the change of working hours of the working women, but also account for the move to zero hours of the women who leave work. As we found that women are more likely to stop working after an adverse health event, this could explain the size of those estimates. On the other hand, the Pooled OLS (employed sample) and the Fixed effects estimates, in which we only consider the working population, show that women work slightly less hours at the time of diagnosis than their healthy peers: 18 hours per year and 5 hours per year, respectively, at the time of diagnosis; reaching four years later 38 hours per year and 15 hours per year. The difference between the two estimates can be explained by the underlying assumptions: while Pooled OLS assumes that there is no unobserved individual heterogeneity, the Fixed effects estimate assumes that there is unobserved individual heterogeneity and takes it into account. As a result, the latter method estimates a smaller difference between the working hours of the healthy and unhealthy women. Though, the effects estimated by both methods are so small that they are economically insignificant. Furthermore, according to the Pooled OLS (employed sample) and the Fixed effects estimates, the minor adjustments in the working hours stop after the second year; however, according to the Pooled OLS (full sample) and the Tobit estimates, they continue even in the fourth year. This difference could be explained by the different sample composition and it suggests that women are more likely to leave work rather than work fewer hours during year 3 and 4. Such a trend could be traced back to the legislation, which enables women to stay formally employed for the first two years after the adverse health event.

With respect to the sample of permanently employed women, we performed similar analysis and we found that their working hours' adjustments are similar in direction and magnitude as the full sample (see Figure 4, middle right graph).

Overall, the comparison of the Tobit, Pooled OLS – full sample and employed sample, and Fixed effect estimates suggests that women are more likely to leave work, rather than reduce their working hours after an adverse health event, which is in line with Jones et al. (2016). Furthermore, the above analysis suggests that there is unobserved time-invariant individual heterogeneity and therefore our preferred estimates are the ones from the Fixed effects model.

Figure 4: Employment, working hours and wage adjustments after an adverse health event



5.3. Wage adjustments

Last, we consider the wage adjustments after an adverse health event. In Figure 4, bottom left graph, we observe differences between the Heckman selection estimator, the Fixed effects panel data estimator, and the Pooled OLS. First, the Heckman selection model assumes that there is selection into employment – only women with better wage possibilities and/or better career development would (choose to) stay employed. Since those and the Pooled OLS estimates of the wage gap between the women who experienced an adverse health event and those who did not are similar, this suggests that selection into employment is not an explanation for the wage gap. Furthermore, while the Heckman selection and the Pooled OLS methods consistently estimate a wage gap between the healthy and unhealthy women (2.5% at the time of diagnosis and around 4% four years later), the Fixed effects model, which assumes that there is unobserved time-invariant individual heterogeneity, estimates it close to zero for the whole period of observation. This result suggests that unobserved time-invariant individual heterogeneity (for example, ability and skills) is important for explaining the wage adjustments after an adverse health event.

Considering the permanently employed women, we observe similar adjustments in their wage (see Figure 4, bottom right graph). At the time of diagnosis, women have 2.5% lower wage in comparison to their peers who are not diagnosed, according to the Pooled OLS estimates. The difference increases four years later to 3%. In comparison, the main analysis estimated a difference in the wage adjustments in the fourth year of almost 4%. This suggests that women on permanent contracts experience less of a 'wage penalty' than women on temporary contracts. Nevertheless, the fixed-effects model estimates the wage differential close to zero in both samples, which suggests that the adjustments in the wage can be related predominantly to unobserved time-invariant personal characteristics.

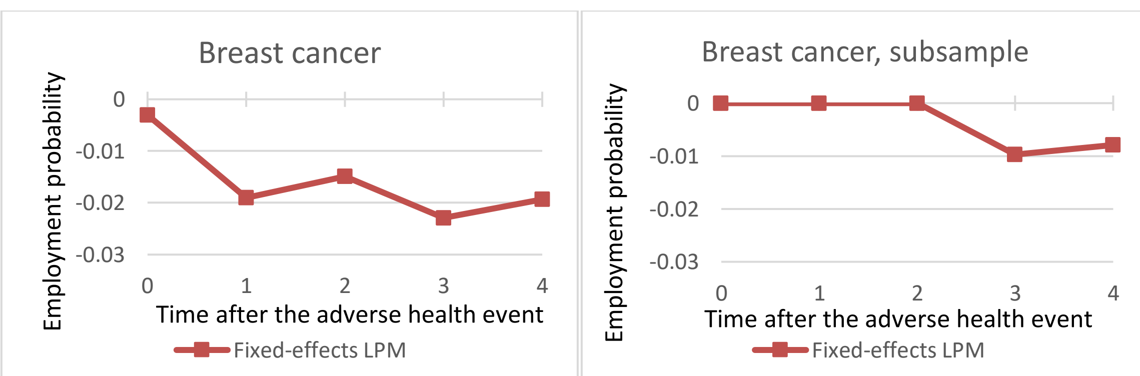
Overall, our results are in line with Jones, Nigel and Zantomio (2016) who find that the hourly wage is not affected after a severe health shock. Meanwhile, the studies that consider earnings, rather than the hourly wage and the working hours separately, find around 2% reductions in the earnings after an adverse health event (Halla and Zweimuller, 2013; Garcia-Gomez et al., 2013).

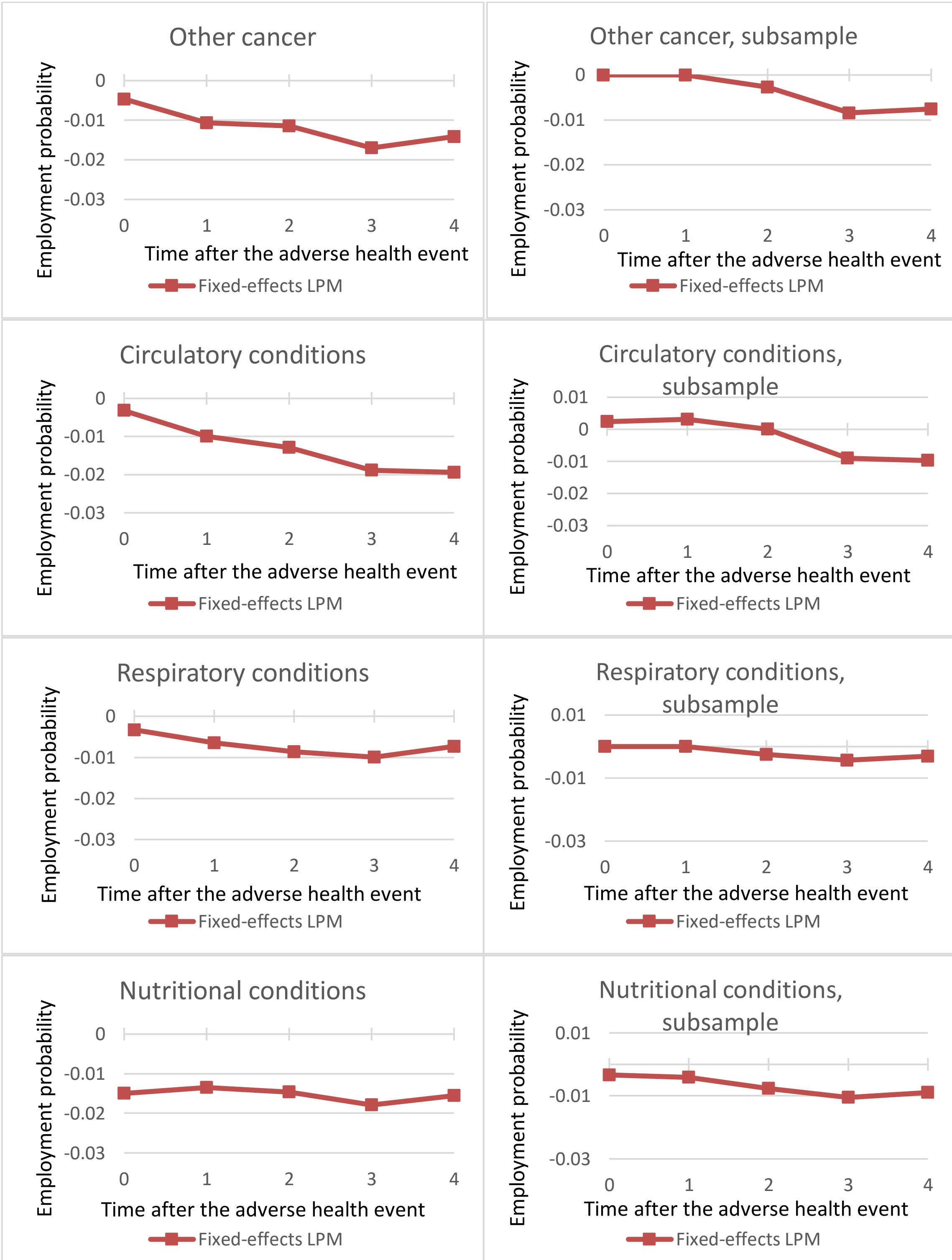
5.4. Distinction between different types of adverse health events

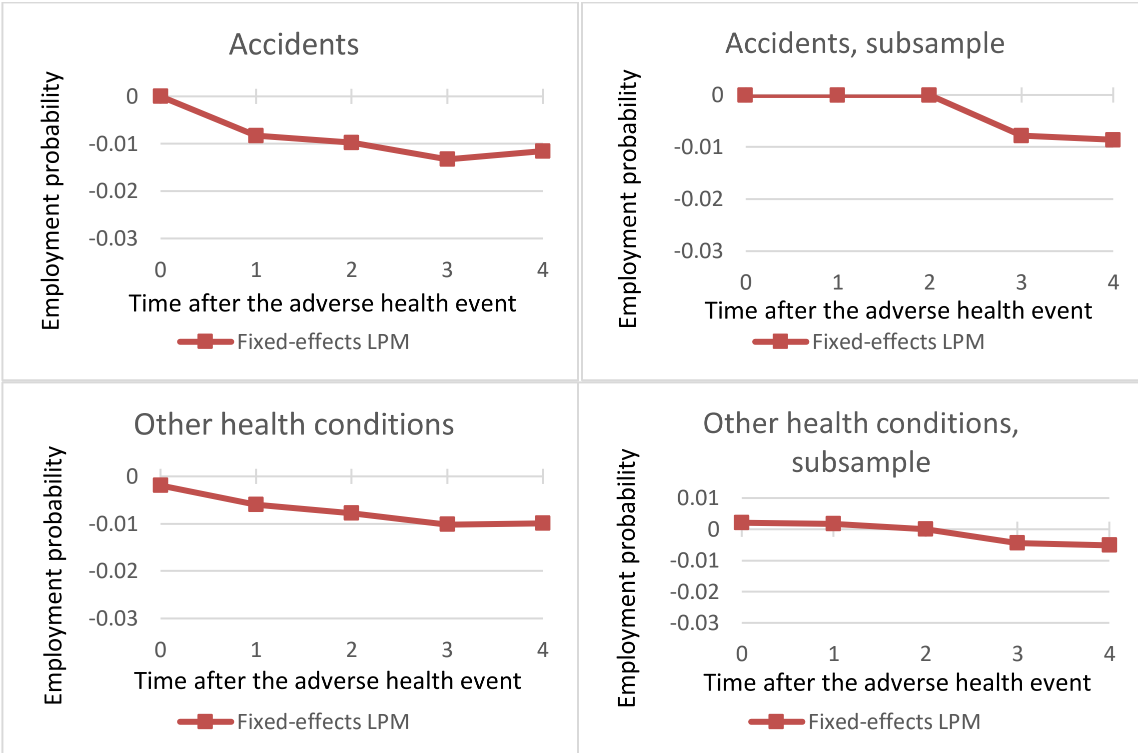
Women visit the hospital for different reasons and sometimes receive more than one diagnosis during the calendar year. Therefore, we consider the different types of adverse health events simultaneously to compare the labor market adjustments after each of them. Furthermore, as shown above, it is most important to control for unobserved individual heterogeneity, we only present estimates of our fixed effects models outlined in section 4. The different types of new adverse health events are all included as independent variables. Appendix 6 presents all estimates.

First, we consider how women adjust their employment and we find that the employment adjustments have similar trends across the different diagnoses: there is an employment gap between the healthy and unhealthy women, which increases over time (Figure 5, left column). However, the size of the gap differs across the different types of health events: in the fourth year after the diagnosis the gap is between 0.74 and 2.00 percentage points. Exceptions are nutritional conditions, where the gap is consistently around 1.50 percentage points. Furthermore, we do not observe the institutionalized job protection for any of the adverse health events. Comparing those results, with the ones of women on permanent contracts, we observe important differences (Figure 5, right column). Women on permanent contracts are likely to leave employment only after some time after the adverse health event. This suggests that there is institutionalized job protection, which enables them to stay longer in employment. For some diagnosis we observe it up to the first year – other cancer and respiratory conditions; while for the rest of the health conditions we observe it up to the second year. An exception are nutritional conditions, after which women are immediately less likely to work.

Figure 5: Employment probability after an adverse health event by type of diagnosis

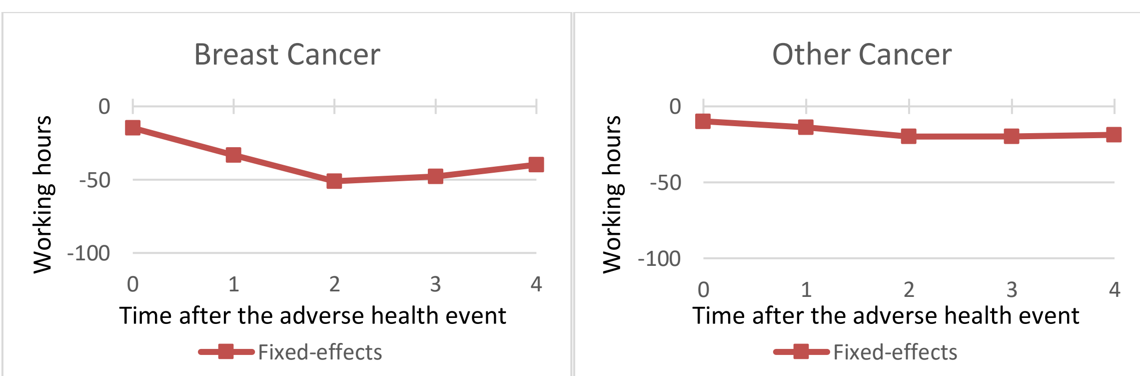


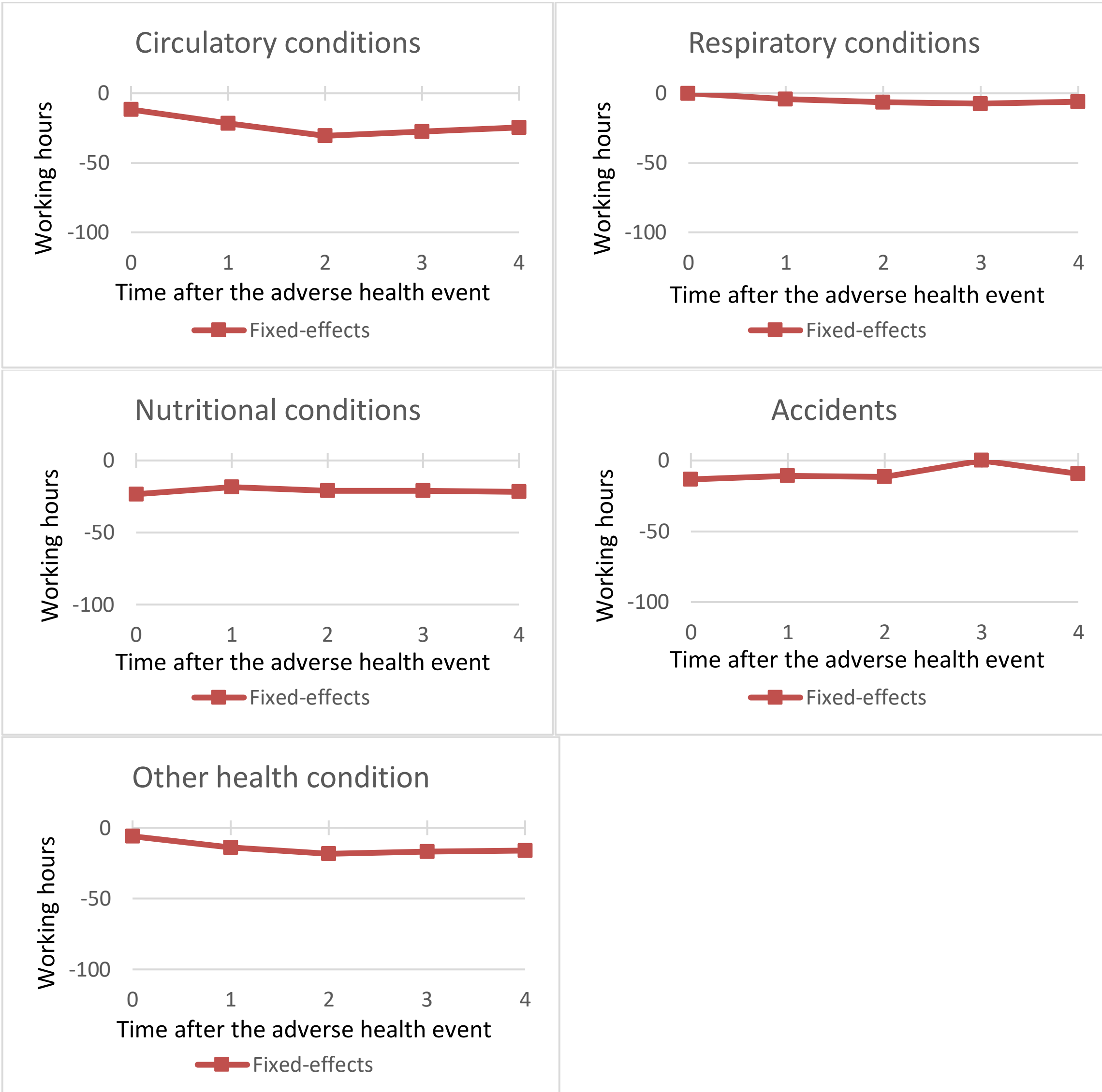

Other cancer
Employment probability
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Other cancer, subsample
Employment probability
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Circulatory conditions
Employment probability
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Circulatory conditions, subsample
Employment probability
0.01
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Respiratory conditions
Employment probability
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Respiratory conditions, subsample
Employment probability
0.01
-0.01
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Nutritional conditions
Employment probability
0
-0.01
-0.02
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM
Nutritional conditions, subsample
Employment probability
0.01
-0.01
-0.03
0 1 2 3 4
Time after the adverse health event
Fixed-effects LPM



Second, we consider how women adjust their working hours after each adverse health event (Figure 6). The strongest reduction of working hours is observed in the group of women diagnosed with breast cancer (50 hours per year), followed by women with circulatory conditions (24 hours per year) and nutritional conditions (21 hours per year). However, the sizes of all adjustments are very small and may be considered economically insignificant. With respect to the changes of the working hours of the permanently employed women, we observe comparable adjustments.

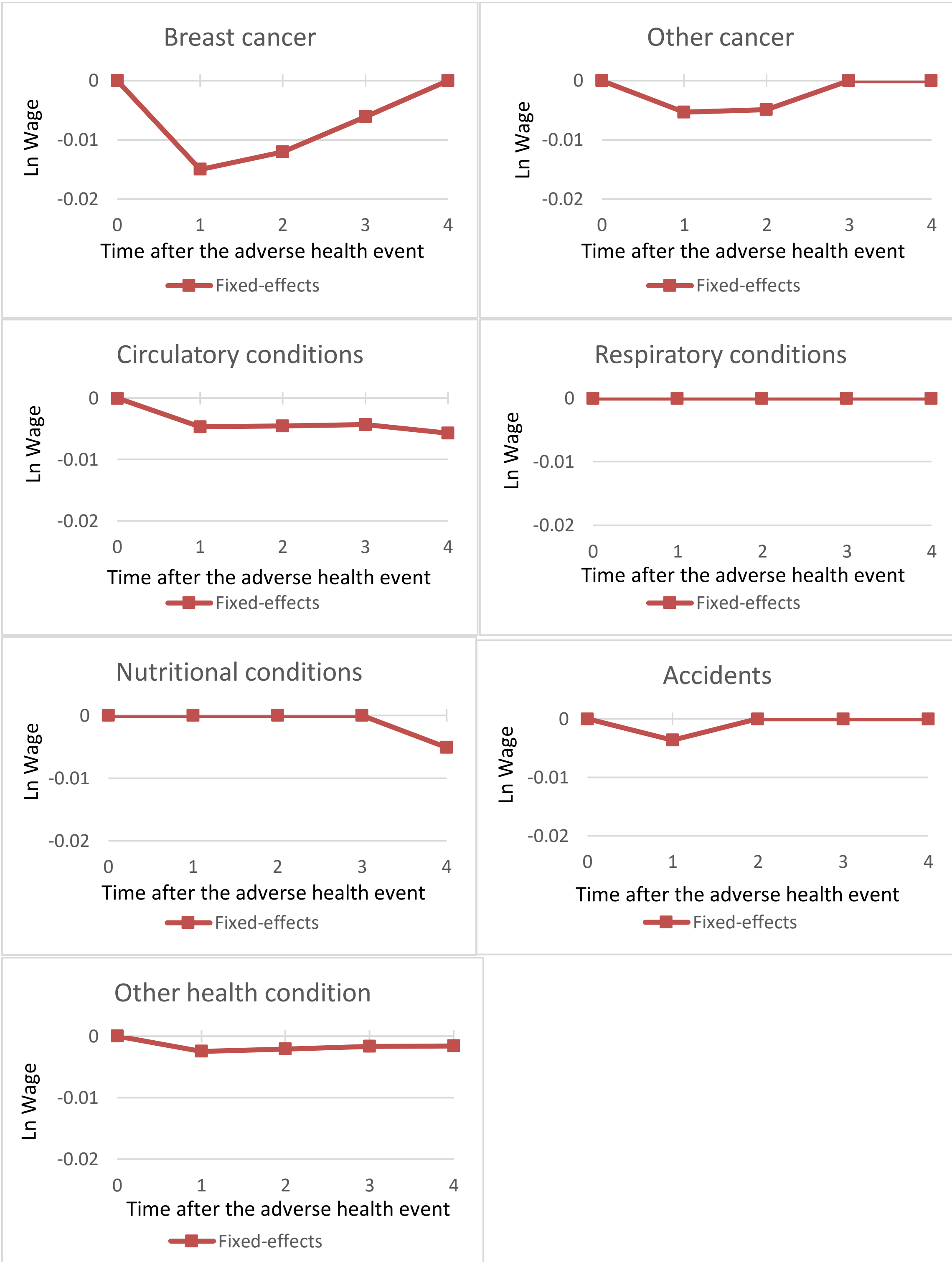
Figure 6: Working hours after an adverse health event by type of diagnosis





Last, we consider women's wage adjustments across the different types of adverse health events (Figure 7). The health conditions that women could recover from, such as cancer, are related to a temporary decrease in the wage profile; while more chronic and incapacitating health conditions, such as circulatory conditions, are related to long term reductions in the wage profile. Furthermore, the chronic and not incapacitating health conditions, such as respiratory and nutritional conditions, do not seem to be related to changes in the wage profile. Permanently employed women experience similar adjustments in their wages. The only exception are women diagnosed with breast cancer: we do not observe a full recovery in their wages, on average.

Figure 7: Wage rate developments after an adverse health event by type of diagnosis



6. Discussion and Conclusion

This paper estimates the adjustments in employment status, working hours, and wage of Dutch women after an adverse health event. Our findings show that women who experienced an adverse health event are likely to leave their employment from the time of diagnosis up to four years later (0.9 percentage points less likely to be employed), which is in line with previous studies. Furthermore, we find evidence that the employment adjustments after the adverse health event could be related to the degree of job protection. Our results show that for women who are in permanent employment and therefore cannot be laid off during the first two years after the onset of the health condition, the job separation is likely to happen only after the initial protection period and to a lesser extent (0.4 percentage points). This result is in line with the idea that longer institutional job protection provides the employee with more time to recover and therefore the health problem should have smaller impact on the employment probability of the individual.

For the women who stay in employment, we found that they are likely to work less hours after an adverse health event, namely 5 hours a year in the year of diagnosis and 15 hours a year four years later. These reduction, however, is negligible in economic terms. Furthermore, while we observe adjustments both in employment probability and working hours during the first two years after the adverse health event, the adjustments are mainly in employment probability during the next two years. This observation is a direct result of the institutionalized job protection, which enables the employee to adjust her working hours during the first two years without losing her job. Nevertheless, our finding that the reduction in working hours was negligible suggests that employment exit was the main mechanism of labor market adjustment; in other words, women did not reduce their working hours, they stopped working which is in line with the existing literature. Women in temporary and permanent employment adjusted similarly their working hours.

Lastly, considering the wage adjustments, we found that women have 0.5% lower wages after an adverse health event in comparison to women who were not diagnosed, irrespective of whether they were in permanent or temporary employment. This result is in accordance with the rest of the literature. Furthermore, we found some important differences in the wage adjustments when we considered the different types of adverse health events. The chronic and incapacitating conditions are related to a long term decrease in the wage profile (approximately 0.5%), while the non-incapacitating conditions seem to not be related to the wage profile. Additionally, the temporary conditions were related to a temporary decrease in the wage profile: 1.5% reduction one year after the diagnosis for breast cancer patients, and 0.5% for other cancer patients; and return to the initial pattern by the fourth year after the diagnosis. Those wage patterns were similar when we considered the permanently employed women. Our results are in line with previous literature and point at the importance of considering the severity of the health condition when considering the consequent wage adjustments.

It is important to note that we do not observe the individual preferences towards work before and after the diagnosis. As a result, we cannot disentangle if it is a personal choice to change the labor supply or the observed changes are a result of changes in the labor demand. Further research would be beneficial for answering this question. Furthermore, the patterns that we observe for women may not be similar for men. Therefore, future investigations into how men behave after an adverse health event would be helpful to understand whether there are differences between the two genders.

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Appendix 1: LMR description and correction for data coverage

An individual is considered as suffering from a disease throughout the year if she has visited a hospital and the condition has been recorded as the main diagnosis. The coding of the diagnosis follows the 'Classification of Sicknesses, 1980' which is based on the International Statistical Classification of Diseases and Related Health Problems, 9 Revision, Clinical Modification. We divide the health conditions into the following groups: breast cancer; other type of cancer; circulatory conditions; diseases of the respiratory system; endocrine, nutritional and metabolic diseases; accidents; and other health conditions. In the occasions when the individual has been in the hospital for cancer therapy, such as radiotherapy, chemotherapy and/or immunotherapy, then this entry has been allocated to either breast cancer, other cancer, or to both based on the incidence of cancer up to three years before. Furthermore, we exclude hospital entries related to birth giving (1.36 % of the hospital entries).

It is important to note that the Hospital registry does not contain exhaustive information pertaining to all hospitals in the Netherlands. Up to and including 2005, the data contains information about inpatient and daycare patients from all general and university hospitals in the Netherlands (Garcia-Gomez et al, 2013). However, from 2006 the participation in the registry has become voluntary and, therefore, the coverage has decreased (Garcia-Gomez and Gielen, 2014). Over all, according to Van der Laan (2013), the data provides record about approx. 88% of the inpatient hospital stays in the country, which is retrieved from general and university hospitals and one specialty hospital. This implies that if we do not correct for the limited coverage of the data, we would underestimate the cases of health conditions in the Dutch population and our results will suffer from attenuation bias. To limit this problem, we use the Housing registry to compute the percentage of people in each municipality who have visited a hospital. We use the postal code distribution across municipality borders from the year 2012, namely 415 municipalities, to avoid bias from changes in the borders. The percentage of individuals who have visited a hospital measured on a municipality level before the years of voluntary reporting is consistently above 5%, and after that it falls to 1% for some municipalities. This statistic guides us to choose 5% as a lower boundary for censoring the data. The result of the censoring is excluding a minimum of 7 municipalities in 2005, and a maximum of 44 in 2008.

Appendix 2: Working hours

The first work indicator of interest is related to the propensity to have a job. An individual is considered as having a job, if she is employed in the Netherlands for at least one day throughout the calendar year. For the working individuals, we are interested in their intensive margin of labor market participation. Therefore, we construct a normalized measure, which is a continuous variable ranging from 0 (denoting working 0 hours throughout the year) to 1 (working full time all year long). The variable is composed as follows:

$$LMsupply = \frac{calendar\ days\ worked * fte}{total\ calendar\ days\ per\ year}$$

Where *calendar days worked* stands for the calendar days the individual has had a job. The time span is corrected for job overlaps. *Fte* denotes the weighted average of the full time work equivalent from all the jobs the individual has had in that calendar year. It spans from 0, denoting no work, to 1, denoting full time work. The weighting is based on the length of the job. Lastly, *total calendar days per year* is equal to the actual length of the calendar year.

From this labor supply indicator we can retrieve the amount of hours the individual has worked throughout the year:

$$Hours\ worked = LMsupply * 40 * 52$$

where 40 is the amount of hours in the work week and 52 denotes the number of weeks in the year. Therefore, our initial indicator ranging from 0 to 1, now spans from 0 to 2080 hours per year. From this information and the gross yearly income of the individual we can retrieve the average hourly wage:

$$Wage\ rate = \frac{cumulative\ gross\ yearly\ income}{hours\ worked}$$

Appendix 3: Mortality up to the end of the calendar year

Since we observe most of the characteristics on 31st December (such as family situation, work and location), women must survive until then to be included in our sample. Table A3 shows the mortality rates before 31st December of women diagnosed with a specific type of disease in the corresponding calendar year. Comparing those with the four-year mortality statistics (Table 1), we observe similar trends: women diagnosed with cancer have the highest mortality probability;

women who suffer from other health conditions and/or have had an accident have one of the lowest.

Year	Breast cancer	Other cancer	Circulatory conditions	Respiratory conditions	Nutritional conditions	Other health conditions	Accidents
2004	3.07%	7.34%	2.41%	1.28%	1.58%	0.70%	0.81%
2005	2.66%	7.01%	2.14%	1.70%	1.45%	0.70%	0.84%
2006	2.95%	6.89%	2.06%	1.63%	1.50%	0.67%	0.65%
2007	2.64%	6.34%	2.20%	1.56%	1.28%	0.62%	0.71%
2008	2.96%	6.19%	1.87%	1.72%	1.47%	0.64%	0.52%

Table A3: Mortality statistics up to the end of the calendar year

Appendix 5: Employment, working hours and wage estimates: no distinction between health conditions

Table A.5.1: Employment, working hours and wage: no distinction between health conditions

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7.1	Model 7.2	Model 8	Model 9
VARIABLES	Pooled OLS	LPM FE	Tobit	POLS fs	POLS es	Fixed-effects	Heckman1	Heckman2	Pooled OLS	Fixed-effects
	Employment	Employment	Hours	Hours	Hours	Hours	Employment	LnWage	LnWage	LnWage
Diagnosis	-0.00914***	-0.000837***	-27.533***	-28.43***	-17.68***	-5.103***	-0.0362***	-0.0251***	-0.0260***	0.000144
	(0.000547)	(0.000323)	(0.9651)	(0.977)	(0.786)	(0.522)	(0.00191)	(0.000586)	(0.000584)	(0.000332)
Diagnosis T-1	-0.0180***	-0.00478***	-47.945***	-48.42***	-26.34***	-12.45***	-0.0677***	-0.0295***	-0.0314***	-0.00247***
	(0.000583)	(0.000400)	(1.0231)	(1.039)	(0.832)	(0.630)	(0.00202)	(0.000626)	(0.000623)	(0.000401)
Diagnosis T-2	-0.0255***	-0.00637***	-65.731***	-66.44***	-34.97***	-16.95***	-0.0943***	-0.0327***	-0.0354***	-0.00264***
	(0.000606)	(0.000443)	(1.0599)	(1.078)	(0.862)	(0.702)	(0.00209)	(0.000651)	(0.000648)	(0.000444)
Diagnosis T-3	-0.0349***	-0.00930***	-80.425***	-80.61***	-35.12***	-15.75***	-0.127***	-0.0341***	-0.0378***	-0.00198***
	(0.000623)	(0.000467)	(1.0866)	(1.104)	(0.878)	(0.737)	(0.00212)	(0.000667)	(0.000663)	(0.000468)
Diagnosis T-4	-0.0393***	-0.00869***	-89.271***	-89.30***	-37.64***	-15.12***	-0.142***	-0.0379***	-0.0421***	-0.00186***
	(0.000629)	(0.000464)	(1.0953)	(1.114)	(0.885)	(0.744)	(0.00213)	(0.000673)	(0.000669)	(0.000472)
Constant	0.923***	0.795***		1.682***	1.844***	1.644***	1.509***	2.570***	2.464***	2.140***
	(0.000674)	(0.000596)		(1.448)	(1.147)	(1.034)	(0.00380)	(0.000625)	(0.000573)	(0.000949)
Previous Health	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Family controls	yes	yes	yes	yes	yes	yes	yes	no	no	no
Age dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	12,815,980	12,815,980	12,815,980	12,815,980	10,042,063	10,042,063	12,815,980	12,815,980	10,042,063	10,042,063
Number of id		3,096,239				2,541,300				2,541,300
R-squared	0.053	0.005		0.129	0.159	0.041			0.030	0.081

Clustered standard errors in parentheses.

Model 3 report marginal effects after Tobit

*** p<0.01, ** p<0.05, * p<0.1

Table A.5.2: Employment, working hours and wage: no distinction between health conditions, subsample of permanently employed

VARIABLES	Model 10 Pooled OLS	Model 11 LPM FE	Model 12 Tobit	Model 13 POLS fs	Model 14 POLS es	Model 15 Fixed-effects	Model 16.1 Heckman1	Model 16.2 Heckman2	Model 17 Pooled OLS	Model 18 Fixed-effects
	Employment	Employment	Hours	Hours	Hours	Hours	Employment	LnWage	LnWage	LnWage
Diagnosis	-0.00967***	0.00246***	-19,942***	-21.31***	-7.537***	0.119	-0.0296***	-0.0238***	-0.0243***	-0.00168***
	(0.000908)	(0.000226)	(1,5244)	(1.523)	(1.007)	(0.538)	(0.00261)	(0.000835)	(0.000833)	(0.000361)
Diagnosis T-1	-0.0134***	0.00278***	-31,295***	-32.59***	-15.14***	-4.434***	-0.0403***	-0.0307***	-0.0315***	-0.00448***
	(0.000961)	(0.000290)	(1,6030)	(1.610)	(1.066)	(0.670)	(0.00277)	(0.000884)	(0.000882)	(0.000441)
Diagnosis T-2	-0.0234***	0.000731**	-53,026***	-54.93***	-24.62***	-11.57***	-0.0694***	-0.0318***	-0.0332***	-0.00379***
	(0.000998)	(0.000335)	(1,6591)	(1.668)	(1.117)	(0.767)	(0.00287)	(0.000919)	(0.000915)	(0.000500)
Diagnosis T-3	-0.0368***	-0.00377***	-72,706***	-73.36***	-19.92***	-10.85***	-0.108***	-0.0299***	-0.0320***	-0.00275***
	(0.00102)	(0.000356)	(1,6971)	(1.703)	(1.126)	(0.789)	(0.00291)	(0.000936)	(0.000930)	(0.000510)
Diagnosis T-4	-0.0463***	-0.00441***	-89,382***	-90.03***	-22.08***	-12.07***	-0.135***	-0.0311***	-0.0339***	-0.00242***
	(0.00103)	(0.000344)	(1,7085)	(1.713)	(1.133)	(0.791)	(0.00291)	(0.000950)	(0.000941)	(0.000520)
Constant	0.561***	0.691***		997.3***	1,726***	1,706***	0.162***	2.783***	2.754***	3.097***
	(0.00131)	(0.000548)		(2.283)	(1.452)	(1.267)	(0.00372)	(0.00159)	(0.000989)	(0.000824)
Previous Health	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Family controls	yes	yes	yes	yes	yes	yes	yes	no	no	no
Age dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	5,816,029	5,816,029	5,816,029	5,816,029	3,917,603	3,917,603	5,816,029	5,816,029	3,917,603	3,917,603
Number of id		1,676,515				1,137,295				1,137,295
R-squared	0.057	0.015		0.095	0.196	0.046			0.023	0.123

Clustered standard errors in parentheses.
Model 12 report marginal effects after Tobit
*** p<0.01, ** p<0.05, * p<0.1

Appendix 6: Employment, working hours and wage: distinction between health conditions

VARIABLES	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
		Full sample			Permanently employed	
	LPM FE	Fixed-effects	Fixed-effects	LPM FE	Fixed-effects	Fixed-effects
	Employment	Hours	LnWage	Employment	Hours	LnWage
BrCancerT	-0.00304*	-14.77***	-0.000471	0.00121	-6.950***	0.00104
	(0.00165)	(2.647)	(0.00176)	(0.00118)	(2.612)	(0.00171)
BrCancerT-1	-0.0190***	-33.11***	-0.0150***	0.000979	-18.57***	-0.0204***
	(0.00218)	(3.147)	(0.00233)	(0.00154)	(3.120)	(0.00222)
BrCancerT-2	-0.0149***	-51.06***	-0.0120***	0.00134	-45.58***	-0.0176***
	(0.00239)	(3.784)	(0.00251)	(0.00178)	(4.041)	(0.00249)
BrCancerT-3	-0.0229***	-47.92***	-0.00612**	-0.00972***	-44.96***	-0.00763***
	(0.00270)	(4.126)	(0.00282)	(0.00219)	(4.299)	(0.00280)
BrCancerT-4	-0.0193***	-39.89***	-0.00398	-0.00788***	-41.67***	-0.00762***
	(0.00279)	(4.251)	(0.00286)	(0.00215)	(4.545)	(0.00293)
OtherCancerT	-0.0047***	-9.828***	-0.000152	7.65e-05	-4.152***	-0.00162
	(0.000949)	(1.518)	(0.00102)	(0.000686)	(1.517)	(0.00102)
OthCancerT-1	-0.0107***	-13.87***	-0.00531***	-0.000688	-9.962***	-0.00807***
	(0.00119)	(1.853)	(0.00124)	(0.000884)	(1.914)	(0.00133)
OthCancerT-2	-0.0114***	-19.89***	-0.00486***	-0.00272***	-19.79***	-0.00562***
	(0.00134)	(2.126)	(0.00135)	(0.00104)	(2.268)	(0.00144)
OthCancerT-3	-0.0170***	-19.83***	-0.00199	-0.00842***	-17.16***	-0.00302*
	(0.00146)	(2.278)	(0.00148)	(0.00114)	(2.369)	(0.00156)
OthCancerT-4	-0.0141***	-18.67***	-0.000809	-0.00757***	-18.93***	-0.00152
	(0.00149)	(2.355)	(0.00150)	(0.00114)	(2.453)	(0.00157)
CirculatoryT	-0.0032***	-11.66***	-0.00140	0.00240***	-4.823***	-0.000342
	(0.000966)	(1.560)	(0.00101)	(0.000640)	(1.589)	(0.00104)
CirculatoryT-1	-0.00991***	-21.66***	-0.00471***	0.00312***	-10.84***	-0.00532***
	(0.00121)	(1.873)	(0.00123)	(0.000823)	(1.961)	(0.00128)
CirculatoryT-2	-0.0129***	-30.57***	-0.00452***	0.000144	-23.91***	-0.00412***
	(0.00135)	(2.125)	(0.00138)	(0.000966)	(2.323)	(0.00146)
CirculatoryT-3	-0.0188***	-27.38***	-0.00429***	-0.00898***	-19.87***	-0.00309**
	(0.00146)	(2.253)	(0.00151)	(0.00110)	(2.385)	(0.00152)
CirculatoryT-4	-0.0194***	-24.44***	-0.00571***	-0.00973***	-18.57***	-0.00395***
	(0.00150)	(2.324)	(0.00151)	(0.00111)	(2.434)	(0.00151)
RespiratoryT	-0.00330***	-2.050	-0.000109	-0.00105	-2.307	-0.00329**
	(0.00117)	(1.917)	(0.00118)	(0.000930)	(2.125)	(0.00131)
RespiratT-1	-0.00643***	-4.277*	-0.000672	-0.000653	-7.046***	-0.00181
	(0.00140)	(2.239)	(0.00134)	(0.00115)	(2.586)	(0.00172)
RespiratT-2	-0.00868***	-6.464***	-0.00172	-0.00248*	-10.99***	0.000189
	(0.00154)	(2.460)	(0.00145)	(0.00130)	(2.920)	(0.00177)
RespiratT-3	-0.00996***	-7.409***	-0.000583	-0.00433***	-9.534***	-0.00107
	(0.00160)	(2.541)	(0.00152)	(0.00135)	(2.927)	(0.00178)
RespiratT-4	-0.00739***	-5.854**	-0.000526	-0.00300**	-10.60***	-0.000657
	(0.00159)	(2.552)	(0.00151)	(0.00132)	(2.959)	(0.00195)
NutritionalT	-0.0150***	-23.35***	0.000380	-0.00335**	-11.18***	-0.00684***

	(0.00191)	(3.203)	(0.00210)	(0.00142)	(3.416)	(0.00196)
NutritionT-1	-0.0135***	-18.46***	-0.00138	-0.00408**	-17.59***	-0.00463
	(0.00242)	(3.868)	(0.00253)	(0.00187)	(4.331)	(0.00284)
NutritionT-2	-0.0147***	-20.95***	-0.00348	-0.00772***	-17.15***	-0.00743**
	(0.00268)	(4.458)	(0.00281)	(0.00204)	(4.897)	(0.00319)
NutritionT-3	-0.0179***	-20.87***	0.00194	-0.0105***	-17.48***	-0.00364
	(0.00286)	(4.617)	(0.00294)	(0.00215)	(4.901)	(0.00305)
NutritionT-4	-0.0156***	-21.57***	-0.00511*	-0.00895***	-13.96***	-0.00480
	(0.00290)	(4.729)	(0.00298)	(0.00215)	(4.962)	(0.00314)
AccidentsT	-0.00232	-13.31***	-0.00141	0.00126	-3.976	-0.00255
	(0.00151)	(2.538)	(0.00163)	(0.00106)	(2.640)	(0.00186)
AccidentsT-1	-0.00824***	-10.98***	-0.00365*	5.65e-05	-5.520*	-0.00359*
	(0.00189)	(3.025)	(0.00190)	(0.00135)	(3.174)	(0.00207)
AccidentsT-2	-0.00978***	-11.62***	-0.00155	-0.00146	-9.179**	-0.00145
	(0.00213)	(3.430)	(0.00215)	(0.00162)	(3.734)	(0.00248)
AccidentsT-3	-0.0133***	-5.651	-0.00308	-0.00784***	-6.801*	-0.00336
	(0.00231)	(3.707)	(0.00228)	(0.00190)	(3.959)	(0.00254)
AccidentsT-4	-0.0116***	-9.284**	0.000780	-0.00860***	-11.89***	0.000790
	(0.00237)	(3.891)	(0.00242)	(0.00188)	(4.190)	(0.00283)
OthHealthPr	-0.00193***	-6.035***	0.000222	0.00209***	-0.617	-0.00212***
	(0.000355)	(0.570)	(0.000364)	(0.000251)	(0.595)	(0.000400)
OthHProbT-1	-0.00594***	-13.97***	-0.00248***	0.00175***	-4.883***	-0.00443***
	(0.000439)	(0.693)	(0.000439)	(0.000325)	(0.743)	(0.000486)
OthHProbT-2	-0.00774***	-18.37***	-0.00211***	-0.000461	-11.33***	-0.00334***
	(0.000488)	(0.773)	(0.000489)	(0.000376)	(0.845)	(0.000553)
OthHProbT-3	-0.0102***	-16.92***	-0.00168***	-0.00441***	-11.20***	-0.00253***
	(0.000514)	(0.812)	(0.000516)	(0.000397)	(0.876)	(0.000569)
OthHProbT-4	-0.00988***	-16.14***	-0.00159***	-0.00516***	-12.07***	-0.00233***
	(0.000513)	(0.824)	(0.000525)	(0.000384)	(0.882)	(0.000582)
Constant	0.797***	1,646***	2.587***	0.692***	1,708***	2.714***
	(0.000598)	(1.036)	(0.000589)	(0.000550)	(1.269)	(0.000690)
Previous Health	yes	yes	yes	yes	yes	yes
Family controls	yes	yes	yes	yes	yes	yes
Age dummies	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Observations	12,815,980	10,042,063	10,042,063	5,816,029	3,917,603	3,917,603
Number of id	3,096,239	2,541,300	2,541,300	1,676,515	1,137,295	1,137,295
R-squared	0.005	0.041	0.081	0.016	0.047	0.123

Clustered standard errors in parentheses. Models 22 to 24 are estimated on a subsample of permanently employed women; *** p<0.01, ** p<0.05, * p<0.10